



[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 27

[Docket No.FAA-2019-0546; Notice No. 27-048-SC]

Special Conditions: Bell Helicopter Textron Canada Limited, Model Bell 505, Visual Flight Rules Autopilot and Stability Augmentation System (AP/SAS System)

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions.

SUMMARY: These special conditions are issued for the Bell Helicopter Textron Canada Limited (BHTCL) Bell Model 505 helicopter. This helicopter as modified by S-TEC will have a novel or unusual design feature associated with installation of the autopilot and stability augmentation system (AP/SAS system). The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

DATES: These special conditions are effective [INSERT DATE OF PUBLICATION IN THE FEDERAL REGISTER].

FOR FURTHER INFORMATION CONTACT: Andy Shaw, Aerospace Engineer, FAA, Rotorcraft Standards Branch, Policy and Innovation Division, 10101 Hillwood Pkwy, Fort Worth, TX 76177; telephone (817) 222-5384; email Andy.Shaw@faa.gov.

SUPPLEMENTARY INFORMATION:

Background

On January 21, 2019, S-TEC applied for a supplemental type certificate (STC) to install an AP/SAS system on the Bell Model 505 helicopter. The Bell Model 505 helicopter is a 14 CFR part 27 normal category, single turbine engine, conventional helicopter designed for civil operation. This helicopter model is capable of carrying up to four passengers with one pilot and has a maximum gross weight of up to 4,475 pounds (external loading). The major design features include a 2-blade main rotor, an anti-torque tail rotor system, a skid landing gear, and a visual flight rule basic avionics configuration. S-TEC proposes to modify this model helicopter by installing an AP/SAS system.

The AP/SAS system provides attitude stabilization in two or three axes (pitch and roll with optional yaw) as well as higher-level autopilot functions such as altitude hold, heading command and navigation tracking. However, the possible failure conditions for this system, and their effect on the continued safe flight and landing of the helicopter, are more severe than those envisioned by the present rules.

The effect on safety is not adequately covered under 14 CFR 27.1309 for the application of new technology and new application of standard technology. Specifically, the present provisions of § 27.1309(c) do not adequately address the safety requirements for systems whose failures could result in catastrophic or hazardous/severe-major failure conditions, or for complex systems whose failures could result in major failure conditions. The current regulations are inadequate because when § 27.1309(c) was promulgated, it was not envisioned that a normal category rotorcraft would use systems that are complex or whose failure could result in "catastrophic" or "hazardous/severe-major" effects on the rotorcraft. This is particularly true with

the application of new technology, new application of standard technology, or other applications not envisioned by the rule that affect safety. Possible failure modes exhibited by the S-TEC AP/SAS system could result in a catastrophic event.

Type Certification Basis

Under 14 CFR 21.101, S-TEC must show that the Bell Model 505 helicopter, as modified by the installed AP/SAS, continues to meet the applicable regulations incorporated by reference in the Type Certificate Number R00008RD. The regulations incorporated by reference in the type certificate are commonly referred to as the “original type certification basis.” The regulations incorporated by reference in Type Certificate Number R00008RD are as follows:

14 CFR part 27, dated October 2, 1964, amendment 27-1 through 27-47

14 CFR part 36, amendment 36-1 through 36-30

In addition, the certification basis includes certain equivalent level of safety findings that are not relevant to these special conditions.

The Administrator has determined the applicable airworthiness regulations (that is, 14 CFR part 27), as they pertain to this STC, do not contain adequate or appropriate safety standards for the Bell Model 505 helicopter because of a novel or unusual design feature. Therefore, special conditions are prescribed under § 21.16.

Special conditions are initially applicable to the model for which they are issued. Should S-TEC apply for an STC to modify any other model included on the same type certificate to incorporate the same novel or unusual design feature, the special conditions would also apply to the other model.

The FAA issues special conditions, as defined in § 11.19, in accordance with § 11.38 and they become part of the type certification basis under § 21.101(d).

Novel or Unusual Design Features

The Bell Model 505 helicopter will incorporate the following novel or unusual design features: AP/SAS. An autopilot (AP) is a system used to control the trajectory of an aircraft without constant input from the pilot. This allows the pilot to focus on other aspects of operations such as weather and systems. A stability augmentation system (SAS) is another type of automatic flight control system; however, instead of maintaining the aircraft on a predetermined attitude or flight path, the SAS will reduce pilot workload by dampening aircraft buffeting regardless of the attitude or flight path.

Discussion

To comply with the provisions of the special conditions, the FAA requires that S-TEC provide the FAA with a systems safety assessment (SSA) for the final AP/SAS installation configuration that will adequately address the safety objectives established by a functional hazard assessment (FHA). This process will ensure that all failure conditions and their resulting effects are adequately addressed for the installed AP/SAS. The SSA process is part of the overall safety assessment process discussed in FAA Advisory Circular 27-1B, Certification of Normal Category Rotorcraft, and Society of Automotive Engineers document Aerospace Recommended Practice (ARP) 4761, Guidelines and Methods for Conducting the Safety Assessment Process on Civil Airborne Systems and Equipment.

These special conditions require that the AP/SAS installed on a Bell Model 505 helicopter meet the requirements to adequately address the failure effects identified by the FHA, and subsequently verified by the SSA, within the defined design integrity requirements.

Failure conditions are classified according to the severity of their effects on the rotorcraft.

Radio Technical Commission for Aeronautics, Inc. (RTCA) Document DO-178C, Software Considerations in Airborne Systems and Equipment Certification, provides software design assurance levels most commonly used for the major, hazardous/severe-major, and catastrophic failure condition categories. The AP/SAS system equipment must be qualified for the expected installation environment. The test procedures prescribed in RTCA Document DO-160G, Environmental Conditions and Test Procedures for Airborne Equipment, are recognized by the FAA as acceptable methodologies for finding compliance with the environmental requirements. Equivalent environment test standards may also be acceptable. Environmental qualification provides data to show that the AP/SAS system can perform its intended function under the expected operating condition. Some of the main considerations for environmental concerns are installation locations and the resulting exposure to environmental conditions for the AP/SAS system equipment, including considerations for other equipment that may also be affected environmentally by the AP/SAS equipment installation. The level of environmental qualification must be related to the severity of the considered failure conditions and effects on the rotorcraft.

Discussion of Comments

Notice of proposed special conditions No. 27-048-SC for the Bell Helicopter Textron Canada Limited (BHTCL) Bell Model 505 helicopter was published in the Federal Register on November 21, 2019 (84 FR 64233). Comments were received from two commenters.

One commenter requested generally that the FAA broaden the scope of the safety standards to allow for expanded technological improvements. This commenter did not request specific changes to the proposed document.

The FAA disagrees. The proposed special condition is not a rule of general applicability. It affects only the model aircraft for which it is issued. The FAA did not make any changes in response to this comment.

Bell Textron, Inc. stated that autopilot and stability augmentation systems are not "novel or unusual" design features because these types of systems are common and have been used in helicopters for many years.

The FAA disagrees. As explained under "Type Certification Basis," the FAA issues special conditions when the conditions in § 21.16 are met. Under that rule, whether a design feature is "novel or unusual" is not determined by how long it has existed or how commonly it is used. Rather, a feature is novel or usual if the applicable airworthiness regulations do not contain adequate or appropriate safety standards to address it. For the reasons explained under "Background," current § 27.1309 does not adequately address the safety requirements for the S-TEC AP/SAS. Accordingly, this system is a novel or unusual design feature under § 21.16. The FAA did not make any changes in response to this comment.

Bell Textron, Inc. also requested the FAA clarify the maximum gross weight stated in the notice of proposed special conditions.

The FAA agrees and has made the requested change. These final special conditions state that the maximum gross weight of 4,475 lbs is for external loading.

Bell Textron, Inc. requested that the FAA add language to the references to ARP 4754 and DO-178C stating that these documents are acceptable methodologies for finding compliance with the applicable requirements and equivalent methodologies may be acceptable.

The FAA agrees to clarify. The notice of proposed special condition does not contain any reference to ARP 4754 and does not require that S-TEC comply with RTCA DO-178C. Rather,

the reference to RTCA DO-178C for software design assurance levels is informational. S-TEC may use ARP 4754A and DO-178C or any other equivalent methodology that the FAA finds acceptable to show compliance. The FAA did not make any changes in response to this comment.

Lastly, Bell Textron, Inc. requested the FAA clarify whether Policy Statement PS-ASW-27-15 can be applied in this application.

The FAA agrees to clarify. FAA Policy Statement PS-ASE-27-15 may be used by S-TEC in showing compliance with this special condition. The FAA did not make any changes in response to this comment.

Applicability

These special conditions are applicable to the S-TEC AP/SAS installed as an STC approval in Bell Model 505 helicopters, Type Certificate Number R00008RD.

Conclusion

This action affects only certain novel or unusual design features for an S-TEC AP/SAS STC installed on one model helicopter. It is not a rule of general applicability and affects only the applicant who applied to the FAA for approval of these features.

List of Subjects in 14 CFR Part 27

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701, 44702, 44704.

The Special Conditions

Accordingly, pursuant to the authority delegated to me by the Administrator, the following special conditions are part of the S-TEC supplemental type certification basis for

installation of an autopilot/stabilization augmentation system (AP/SAS) system on Bell Model 505 helicopters.

Instead of the requirements of 14 CFR 27.1309(b) and (c), the following must be met for certification of the AP/SAS system installed on Bell Model 505 helicopters:

- a. The equipment and systems must be designed and installed so that any equipment and systems do not adversely affect the safety of the rotorcraft or its occupants.
- b. The rotorcraft systems and associated components considered separately and in relation to others systems, must be designed and installed so that:
 - (1) The occurrence of any catastrophic failure condition is extremely improbable;
 - (2) The occurrence of any hazardous failure condition is extremely remote; and
 - (3) The occurrence of any major failure condition is remote.
- c. Information concerning an unsafe system operating condition must be provided in a timely manner to the crew to enable them to take appropriate corrective action. An appropriate alert must be provided if immediate pilot awareness and immediate or subsequent corrective action is required. Systems and controls, including indications and annunciations, must be designed to minimize crew errors which could create additional hazards.

Issued in Fort Worth, Texas on January 30, 2020.

Stephen Barbini,
Acting Manager, Rotorcraft Standards Branch,
Policy and Innovation Division,
Aircraft Certification Service

[FR Doc. 2020-02741 Filed: 2/18/2020 8:45 am; Publication Date: 2/19/2020]